

BROOKHAVEN NATIONAL LABORATORY

SBMS Interim Procedure

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Title: Job Risk Assessment (JRA)

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Management System: Occupational Safety and Health

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Applicability: Plant Engineering Division, Central Fabrication Services Division, and Collider-Accelerator Department

Table of Contents

1.	Purpose.....	1
2.	Definitions.....	1
3.	Responsibilities	3
4.	Scope.....	3
5.	Procedure.....	3
5.1.	Review of Job Hazards and Risks	3
5.2.	Performing the JRA	6
5.3.	Job Stressors	7
5.4.	JRA Results	7
5.5.	Annual JRA Review	7
5.6.	JRA in Response to Accidents, Incidents, Non-Conformances, Corrective and Preventative Actions	7
5.7.	Job Step or Task Change	8
5.8.	Common Hazard Terminology	8

1. Purpose

- 1.1. This procedure establishes a standard method for developing, using and maintaining Job Risk Assessment (JRA) forms that will meet the requirements of OHSAS 18001 Clause 4.3.1.

2. Definitions

- 2.1. Control – in this context, a control is any engineered system, protective equipment or administrative arrangement that eliminates a hazard or reduces its likelihood of causing an injury or illness.

- 2.2. Frequency – the rate at which a specific job is performed. There are five classes of frequency: less than or equal to once per year, less than or equal to once per month, less than or equal to once per week, less than or equal to once per shift and greater than once per shift.
- 2.3. Hazard - a source of danger; a possibility of incurring loss or misfortune; "radiation is a health hazard."
- 2.4. Job - A job is a sequence of separate steps or activities that together accomplish a work goal. Some jobs can be defined broadly, for example: "making concrete shielding block," "building a beam-enclosure," or "decommissioning a beam-line." Such broad definitions are not very useful for hazard identification, however. It is too easy to overlook an included task that may present a hazard. At the other extreme, a narrow definition-such as "tighten a screw" or "push the button" is also not suitable, since one would be faced with analyzing thousands or millions of minute tasks. The right answer lies in a definition that is broad enough to result in a relatively small number of steps, each of which can easily be analyzed for associated hazards. See Table 1 for a list of example jobs.
- 2.5. Job Stressors – Factors that may increase the potential likelihood of an injury or illness.
- 2.6. Likelihood – the chances of an event that leads to bad consequences. The five classes of likelihood are: impossible, unlikely, possible, probable, and multiple. An event might be a slip or fall, unanticipated radiation, a dropped load from a forklift, etc.
- 2.7. Number of People – Number of people performing the job step that are exposed to a specific hazard.
- 2.8. Priority – in this context, the order in which the initial job risk assessments are done. High priority jobs are jobs that have a recent history involving a high severity injury (severity level 4 or 5), or a job in which injuries are likely to occur (likelihood level 4 or 5), or a job in which there is a recent history of DOE reportable occurrences. Assess and reduce the risks in these jobs first. Medium priority is where hazards with potential for high severity (severity level 4 or 5) are often encountered by personnel (frequency level 4 or 5), but injury is not likely (likelihood level 1, 2 or 3). Assess these jobs next. Low priority jobs are all remaining jobs, and they would be assessed last.
- 2.9. Risk – in this context, risk is the product of the number of people performing the job step, and the points assigned to frequency, likelihood and severity. Points for frequency, likelihood and severity are based on a stepwise numerical system developed by Liberty Mutual Company. A specific range of point values for risk is associated with one of five descriptive classes of risk: negligible, acceptable, moderate, substantial and intolerable.
- 2.10. Severity – the bad consequences of an event. The five classes of severity are: first-aid, medical treatment, lost time, partial disability, and death or permanent disability.

3. Responsibilities

- 3.1. The Departmental/Divisional OSH Management Representative is responsible for ensuring that each job has a current assessment of the occupational safety and health hazards and risks. All moderate, substantial and intolerable risks must be adequately addressed. The assessment may be done by a variety of means. An example would be to assemble a team of managers, supervisors, workers and ESH professionals to perform the assessment.
- 3.2. The Departmental/Divisional OSH Management Representative or his/her designate is responsible for assuring that a job risk assessment has been performed and shall approve each job risk assessment.

4. Scope

- 4.1. OHSAS Clause 4.3.1 requires the job identification process cover non-routine as well as routine activities. Remember to include abnormal, unusual, and non-routine operations such as major repair events, weekend operations, night shifts, contractor activities, operations conducted at remote locations, maintenance operations that are carried out infrequently but may have a high risk, and situations that involve response to emergencies.

NOTE

This procedure does not address facility-wide or area risks assessment. Some hazards may arise from activities or tasks not associated with a specific job. The facility itself and its general operations present certain exposures to hazards. For example, electrical equipment, access and egress, fire hazards, heat or cold conditions, tripping hazards, noise exposures, radiation exposures and chemical exposures. See the Facility Risk Assessment Procedure for more information.

5. Procedure

5.1. Review of Job Hazards and Risks

- 5.1.1. Develop a complete listing of all jobs underway in your Division/Department. Use the example job list shown in Table 1.
 - 5.1.1.1. Make a “rough draft” estimate of hazards and risks for each job. See column four of Table 1. Look for hazards that are obvious and risks that are clearly serious.
 - 5.1.1.2. Develop priorities based on previous experience, information on known work hazards in each area, and the number of employees who are exposed to the hazard. Draw on the personal experience of your risk assessment team. Key operational personnel may be aware of hazards that are not apparent from injury records. Their insights will help you set priorities, as well as identify

additional hazards. Newly created jobs that have no history should be examined carefully to establish a preliminary priority.

- 5.1.1.3. Decide the appropriate number of jobs to be assessed. In practice, the number of jobs in your organization is so large that performing a JRA on all jobs in complete detail is likely to be impossible, given realistic allocation of resources. As a minimum, all High priority jobs should be assessed as soon as practicable. *Nearly every organization moves through this process in phases, over time. Thus, it is important to concentrate your initial efforts on those jobs that clearly present more significant risks and fill in other jobs over time.*

Table 1 Strategy to Determine the Priority of Job Risk Assessments

Job	Description	Priority	Reason
Transportation	Vehicle use for moving materials	High	Recent dropped load from flatbed truck.
Material handling-machinery	Cranes, forklifts, etc.	High	Recent forklift dropped load.
Material handling-manual	Human lifting	Medium	Back injuries have occurred.
Electrical work- routine	<600 V	Medium	Hazard is experienced daily by many workers. Controls have been effective.
Electrical work-high energy	>600 V	Medium	Hazard is experienced daily by many workers. Controls have been effective.
Electrical working hot	Working on energized equipment	Medium	High consequences. Controls have been effective.
Radiation/contamination work	Work in posted areas	Low	Compliance issue. Very detailed controls in place and significant oversight.
Work with lasers	Lasers at research facilities	Medium	Recent injury at Chemistry but external review of BNL laser safety recently completed.
Pressurized system work	Liquid and gas systems	Medium	Hazard is experienced daily by many workers. Controls have been effective. Cryogenic personnel responded to a few pressure boundary leaks in the last few years.
Vacuum system work	Beam lines and vacuum system equipment	Low	No recent injuries.
Biological/animal work	NSRL or Building 912	Low	In one facility and good controls in place.
Cable pulling	Various locations	High	Done a few times per year by many workers with varying experience. Injuries have occurred in the past.
Operations	MCR, CAS, Siemens, Cryogenics, Tandem	Low	No recent injuries.
Emergency response	LEC, DEC and emergency forces	Low	No recent injuries.
Waste handling	Radioactive, hazardous, industrial wastes	Low	No recent injuries.
Work with hazardous materials	Be, lead, chemicals, etc.	Low	No recent injuries.
Adding cooling tower chemicals	Adding water treatment chemicals	Medium	A Water Group technician inhaled water chemical vapors in the last year that caused concern. No recent injuries. CMS in place.
Hi-pot testing	Various locations	Medium	High consequences and done frequently.
Crane use by C-AD staff	Use by non-riggers	Medium	Recent rigging occurrences require a closer look here.
Forklift use by C-AD staff	Use by non-riggers	Medium	Recent forklift occurrences require a closer look here.
Welding/Welding Helper	Various locations	Medium	Recent issue with welder's helper getting arc-eye.
Tours	Various locations	Low	No injuries or perceived health issues. Good escort program in place.
Other to be determined	Identify other detailed jobs while doing area assessment	To be determined	Area assessment will likely discover complex jobs that require detailed job assessment

5.2. Performing the JRA

5.2.1. BNL requires that Departments and Divisions use the data entry form in Table 2 to record the information gathered from the JRA process.

5.2.2. Use the following ten steps to perform JRA and complete Table 2:

- break down the job into successive steps or tasks
- identify the hazards associated with each step and task
- identify controls in place for each hazard
- identify the number of people involved in each step and task
- identify the Frequency that each step and task is performed using the shaded area of Table 2
- estimate the potential Severity of an accident associated with each hazard using the shaded area of Table 2
- estimate the Likelihood of an accident occurring for each hazard (given existing controls) using the shaded area of Table 2
- calculate the Risk
- identify possible additional controls needed for these hazards
- re-calculate the Risk and the % Risk reduction if controls are added

5.2.3. Model your JRA after the practical example that is shown in Table 3.

NOTE

Each hazard should occupy one line in the risk table. That is, the risk from each hazard is to be assessed individually. A single activity like “welding, soldering or brazing” must be entered three times in the table since there are three hazards associated with this activity, which are UV exposure, burns and fires. See the example in Table 3.

5.2.4. Classify the Risk of each job step using the information in the bottom portion of the Table.

5.2.5. Any job step with risk identified as “intolerable” must be investigated and abated immediately. Unless specific exception is granted by the Department Chair / Division Head in writing, the job step will be suspended until the risk can be re-classified as no greater than “substantial.”

5.2.6. Risks identified as “substantial” will require the development and implementation of a written remedial action program prior to proceeding with the work.

5.2.7. Risks identified as “moderate” or below shall be addressed through the Department’s/Division’s normal OSH Management System objective-setting and planning processes.

5.3. Job Stressors

- 5.3.1. Note any job stressors on the JRA form. Job stressors must be factored into the risk assessment if they are present. See the list of common job stressors in [Appendix 1](#). Job stressors will increase the likelihood of an injury.

5.4. JRA Results

- 5.4.1. As indicated in OHSAS 18001 Clause 4.3.1, use the JRA process to help determine:
- job requirements
 - training needs
 - development of controls
- 5.4.2. The JRA process must include some means of monitoring improvement actions added to reduce risk in order to ensure that actions are implemented on time and are effective. The use of Family Action Tracking System (FATS) or equivalent is an acceptable system for this purpose.
- 5.4.3. Additionally, your Department/Division must consider the results of the JRA process and effects of controls when establishing annual OSH objectives. Jobs steps and tasks where injuries and incidents have occurred during the year, as well as risk levels in the Substantial category, should be considered when setting annual OSH objectives.

5.5. Annual JRA Review

- 5.5.1. On an on-going basis, the OSH Management Representative is responsible for scheduling annual reviews of JRAs. The purpose of such reviews is to ensure the JRAs reflect the current jobs at the site.
- 5.5.2. The OSH Management Representative will assign a team to review job hazards and risks annually.
- 5.5.3. The team will base its intensity of review of a particular job on the level of risk assigned to hazards in prior JRAs.

5.6. JRA in Response to Accidents, Incidents, Non-Conformances, Corrective and Preventative Actions

- 5.6.1. As necessary, the OSH Management Representative shall schedule and assign appropriate personnel to conduct or update a JRA in conjunction with a Critique, Occurrence, near miss or non-conformance associated with a job.

5.7. Job Step or Task Change

- 5.7.1. The OSH Management Representative shall schedule and assign appropriate personnel to review all changes and modification to a job step or task where hazards have been introduced or remediate and conduct a new or modified JRA for job steps and activities under the Department's/Division's purview.

5.8. Common Hazard Terminology

- 5.8.1. The use of common hazard terminology is encouraged and it simplifies the risk assessment process. The following are common terms or phrases for hazards that are used by BNL's insurance carrier, Liberty Mutual. They are the leading causes of workplace injuries and are listed in order of cost of wage replacement and medical payments.

Overexertion – injuries caused by excessive lifting, pushing, pulling, holding, or carrying of an object
Falls on same level
Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling
Falls to lower level, such as falling from a ladder or over a railing
Being struck by an object, such as a tool falling on a worker from above
Repetitive motion
Roadway accidents
Being struck against an object – such as a carpenter walking into a doorframe, or cuts and skin abrasions from working in tight spaces
Becoming caught in or compressed by equipment
Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns

- 5.8.2. The following are common hazard terms or phrases that relate to common hazards at BNL.

Electrocution and electrical shock
Ionizing radiation exposure
Fires
Hazardous or toxic material exposures
Non-ionizing radiation exposure (rf, UV, laser)

Table 2 BNL Job Risk Assessment Form

Name(s) of Risk Team Members:				Point Value → Parameter ↓	1	2	3	4	5								
Job Title: Job Number or Job Identifier:				Frequency (B)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift								
Job Description:				Severity (C)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability								
Training and Procedures List (optional):				Likelihood (D)	Impossible	Unlikely	Possible	Probable	Multiple								
Approved by:		Date:	Rev. #:														
Stressors (if applicable, please list all):			Reason for Revision (if applicable):					Comments:									
				Before Additional Controls									After Additional Controls				
Job Step / Task	Hazard	Control(s)		Stressors Y/N	# of People A	Frequency B	Severity C	Likelihood D	Risk* AxBxCxD	Control(s) Added to Reduce Risk	Stressors Y/N	# of People A	Frequency B	Severity C	Likelihood D	Risk* AxBxCxD	% Risk Reduction
Further Description of Controls Added to Reduce Risk:																	
*Risk:	0 to 20		21 to 40		41-60			61 to 80			81 or greater						
	Negligible		Acceptable		Moderate			Substantial			Intolerable						

Table 3 Example BNL Job Risk Assessment Form

Name(s) of Risk Team Members: E. Lessard and D. Passarello				Point Value → Parameter ↓	1		2		3		4		5			
Job Title: Vacuum System Work Job Number or Job Identifier: JRA 10				Frequency (B)	≤once/year		≤once/month		≤once/week		≤once/shift		>once/shift			
Job Description: Bake-out of accelerator vacuum systems.				Severity (C)	First Aid Only		Medical Treatment		Lost Time		Partial Disability		Death or Permanent Disability			
Training and Procedures List (optional): See Vacuum Group procedures				Likelihood (D)	Impossible		Unlikely		Possible		Probable		Multiple			
Approved by: <i>E. Lessard</i> Date: 6-15-04 Rev. #: 0																
Stressors (if applicable, please list all):				Reason for Revision (if applicable):						Comments:						
				Before Additional Controls									After Additional Controls			
Job Step / Task	Hazard	Control(s)	Stressors Y/N	# of People A	Frequency B	Severity C	Likelihood D	Risk* AxBxCxD	Control(s) Added to Reduce Risk	Stressors Y/N	# of People A	Frequency B	Severity C	Likelihood D	Risk* AxBxCxD	% Risk Reduction
Equipment Setup (Moving heavy equipment from shop to RHIC or Booster)	Overexertion – injuries caused by excessive lifting, pushing, pulling, holding, or carrying of an object	Equipment on wheels, lift gate on step van, back safety training, use of squat lift technique, use of team lift, use of mechanical devices to assist in lift	N	2	2	3	3	36								
Equipment Setup (Slip on ramps or wet surfaces in RHIC or Booster)	Falls on same level	Slip resistant footwear (e.g., steel toe sneakers), housekeeping rules	N	2	2	4	3	48								
Equipment Setup (Lifting or pushing heavy equipment up ramps)	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Use of dollies to eliminate manual material handling tasks, use of portable lighting to increase visibility at job site, ergonomic reviews of work, effective supervision at the job site, training	N	2	2	3	4	48	Increase the number of ergonomic reviews of vacuum system work	N	2	2	3	3	36	25%
Equipment Setup (Climbing on RHIC cryostats)	Falls to lower level, such as falling from a ladder or over a railing	Fall protection for work above 4 feet, training, selecting the right ladder for the job, inspecting the ladder, climbing and descending the ladder properly	N	2	2	5	2	40	Develop an improved fall protection program	N	2	2	4	2	32	20%
Equipment Setup (Temporary lighting stands can fall over, equipment on wheels can roll into people)	Being struck by an object, such as a tool falling on a worker from above	Hardhats, safety glasses, wheel locks, work planning	N	2	2	3	2	24								

Table 3 Example BNL Job Risk Assessment Form

Equipment Setup (Removing heating tapes from boxes and applying them to beam line)	Fiberglass dust from heater tapes	Ventilation of the work area, gloves and tight fitting clothing to help prevent skin exposure problems by reducing direct contact with glass fibers, dust masks to help prevent or reduce the inhalation of small fiberglass particles, goggles that fit properly to prevent eye irritation.	N	2	2	2	4	24	Determine the size of fiberglass particles to ensure dust masks offer adequate protection for lungs							
Equipment Setup (Contact with energized conductors in ion pumps, transformers, power distribution circuits)	Electrocution	Electrical safety training, written procedures for setting up transformers and heating elements; bake-out equipment meets UL or equivalent testing standards	N	2	2	5	2	30								
Bake Out (Contact with temporary task lighting, contact with heating elements)	Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns	Heating blankets and foil cover the heating elements, posted signs that state “Bake Out In Progress”	N	2	2	2	3	24								
Bake Out (Working in Booster Radiation Area)	Ionizing radiation exposure	Work planning, use of time, distance and shielding to reduce exposure, ALARA review of high dose jobs, RWP	N	2	2	1	2	8								
Equipment Setup and Bake Out (In Booster)	Being struck against an object - cuts and skin abrasions from working in tight spaces	Knee and elbow pads, steel-toe shoes, gloves, work clothing	N	2	2	3	4	48	Increase the number of ergonomic reviews of vacuum system work	N	2	2	3	3	36	25%
Further Description of Controls Added to Reduce Risk:																
*Risk:	0 to 20		21 to 40			41-60			61 to 80			81 or greater				
	Negligible		Acceptable			Moderate			Substantial			Intolerable				

Appendix 1 Typical Stressors in the Work Place

Environmental Stressors	
Air Temperature	Dust
Humidity	Emergency Lighting
Lighting	Odor
Moisture	Oxygen Deficiency
Over Pressure / Negative Pressure	Temperature / Humidity Variation
Ventilation / Air Speed	Working Alone
Physical Stressors	
Lack of Breaks	Length of Work Day
Time Pressure	Monotony
Qualifications of Co-Workers	
Social Stressors and Issues	
Availability of Eyewashes and Showers	Availability of Changing Rooms
Responsibility for First Aid	Availability of Drinking Water
Availability of Responsible Leader	Availability of Washing Facilities
Availability of Separate Eating Facilities	Protection of Non-Smokers
Availability of Toilets	Working Atmosphere